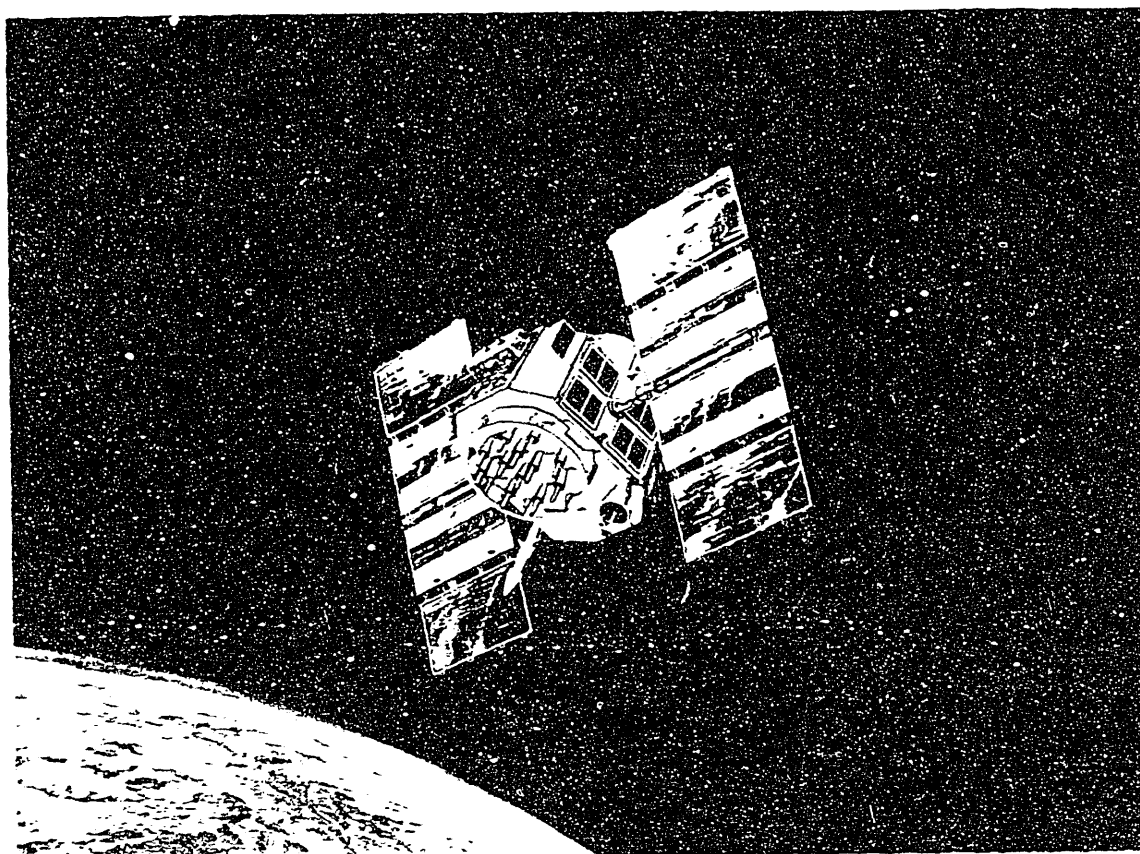




United States Air Force

OFFICE OF PUBLIC AFFAIRS, AIR FORCE SYSTEMS COMMAND, ANDREWS AFB, MD 20334, (301) 761-4137

NAVSTAR GLOBAL POSITIONING SYSTEM



(USAF Photo CN 82-081/1)

THE NAVSTAR GLOBAL POSITIONING SYSTEM (GPS), a space-based radio navigation network, is currently undergoing full-scale engineering development at the Air Force Systems Command's Space Division (SD) in Los Angeles, CA. This multiservice program will provide precise navigation coverage for users throughout the world by the late 1980s.

(PA No. 018.82 - Current as of April 1982)

In the fully operational system, satellites circling the globe every 12 hours will beam continuous navigation signals to Earth. With proper equipment, a user can process the signals and determine his position within tens of feet, his velocity within a fraction of a mile per hour, and the time within a millionth of a second.

To receive this information, a Navstar user only needs to push a few buttons. A user set will then automatically select four satellites most favorably located, lock onto their navigation signals, and compute the user's position, velocity, and time.

Receiving sets are being developed for integration with aircraft, land vehicles and ships; a lightweight backpack unit is under production and test for use by ground troops. Promising airborne and ground tests of these various user sets have been under way for more than three years at the Army's Yuma Proving Ground in Arizona.

The Navstar program is being developed in three phases. During the initial concept validation phase, six satellites were positioned in two orbital planes to provide periodic three-dimensional coverage at Yuma and other test sites. This satellite constellation is being maintained in the second phase for the Trident Improved Accuracy program and GPS. In the third phase, a six-plane fully operational system of 18 satellites will transmit continuous three-dimensional navigation signals to users around the world. The satellites will be tracked, controlled, and monitored by personnel at the Navstar Master Control Station to be located within the continental United States.

Navstar GPS equipment is being developed so it can perform many of the functions now collectively accomplished by a number of separate navigation systems. A single Navstar receiver aboard an aircraft, for example, could achieve or surpass the capabilities of up to five individual pieces of equipment. Further, Navstar could do so at a lower equipment cost.

ACCURACY: Position: Within 52 feet (16 m) in three dimensions.

Velocity: Within 0.3 foot/second (0.1 m/sec) in three dimensions.

Time: Within a millionth of a second.

APPLICATION: Precision weapons delivery; enroute navigation for space, air, land, and sea vehicles; aircraft runway approach; photomapping; geodetic surveys; aerial rendezvous/refueling; tactical missile navigation system updating; air traffic control; range instrumentation and safety, as well as search and rescue operations.

LAUNCH OPERATIONS: The USAF/General Dynamics Atlas-E/F with a Fairchild upper stage will boost the initial seven Navstar satellites from Vandenberg AFB, CA. The next four satellites will use a McDonnell Douglas upper stage to achieve the initial orbit. Operational (Block II) Navstar spacecraft are scheduled to be launched by the space shuttle.

ORBIT: The Navstar satellites are three-axis stabilized in a subsynchronous 10,900 nautical miles (20,178 k) circular orbit with an orbit period of 12 hours. In a fully operational system, at least 18 satellites will be positioned to provide global coverage.

SATELLITE CHARACTERISTICS

STRUCTURE: Aluminum honeycomb.

WEIGHT: Block I - 1,739 pounds (789 kg) at launch, 1,016 pounds (461 kg) in orbit. Block I replenishment - 1,915 pounds (869 kg) at launch, 1,131 pounds (513 kg) in orbit. Block II 3,675 pounds (1,667 kg) at launch, 1,799 pounds (816 kg) in orbit.

SIZE: Block I - 210 inches (533 cm) from solar array tip to solar array tip. Block II - 230 inches (585 cm) from solar array tip to solar array tip.

TRANSMITTING FREQUENCIES: Block I - Two L-band, pseudo-random noise-coded signals and one S-band. Block I replenishment - Three L-Band, pseudo-random noise-coded signals and one S-Band. Block II - Three L-Band, pseudo-random noise-coded signals, one S-Band, and one UHF frequency for spacecraft-to-spacecraft data relay.

PARTS: Over 33,000.

SOLAR ARRAY: Block I - 59 square feet (5 sq m) 400-watt end of life. Block I Replenishment - 59 square feet (5 sq m) 440-watt end of life. Block II - 78 square feet (7.25 sq m) 710-watt end of life.

LIFETIME DESIGN: Block I - five years. Block II - Seven and one-half years.

FULL-ECLIPSE OPERATION: Block I - Three 15-amp-hour nickel cadmium batteries. Block II - Three 35-amp-hour nickel cadmium batteries.

SYSTEMS CLOCK: Block I - Three atomic clocks of rubidium type and one atomic clock of cesium type. Block II - Two atomic clocks of rubidium type and two atomic clocks of cesium type.

USER EQUIPMENT: Three general classes: single channel, two channel and five channel. These classes include antenna, receiver, signal processor, flexible modular interface and control/display unit. Projected operational costs are dependent on class and configuration; single or dual frequency.

NAVSTAR CONTROL SEGMENT: Five widely separated monitor stations will passively track all satellites in view and accumulate ranging data from the navigation signals. This information will be processed at a Navstar Master Control station for use in satellite orbit determination and systematic error elimination. The control station will also act as the two-way communications link with the satellites. Through these links, the satellites' computers will be updated with information so users will receive optimum mission performance. In addition, the communications link will provide telemetry, tracking, and command and control functions.

PROGRAM MANAGEMENT: Air Force Systems Command's Space Division acts as executive agent for the Department of Defense in managing the Navstar GPS program. The joint program office, located at Space Division in Los Angeles, has representatives from the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation and NATO member nations.

MAJOR CONTRACTORS: Space Segment - Rockwell International, Space Systems Div., Seal Beach, CA.

User Segment - Rockwell International, Collins Government Avionics Div., Cedar Rapids, IO; Magnavox Government Electronic Div., Torrance, CA.

Control Segment - IBM, Federal Systems Div., Gaithersburg, MD.

ASSOCIATED ACTIVITIES: Midcourse Guidance - Air Force Armament Lab

SATRACK Program - Navy, Applied Physics Lab

SEASAT Program - NASA, Defense Mapping Agency

PROGRAM HIGHLIGHTS/MILESTONES:

Dec 1973 - DSARC I and concept validation program approval.

Jun 1974 - Initial space segment contract let to Rockwell International.

Oct 1974 - Control user contract let to General Dynamics (Phase I).

Mar 1977 - Yuma testing under way using ground transmitters to simulate satellites.

Feb 1978 - Navstar 1 launch.

May 1978 - Navstar 2 launch.

Oct 1978 - Navstar 3 launch.

Oct 1978 - Yuma testing begins with satellite/ground transmitter mix.

Dec 1978 - Navstar 4 launch. Yuma testing with four satellites begins.

Jun 1979 - DSARC 2/full-scale engineering development approval.

Jul 1979 - Phase II user set development contracts awarded.

Oct 1979 - Rockwell International awarded contract for three Block I replenishment satellites.

Jan 1980 - First Minuteman III with GPS receiver launched.

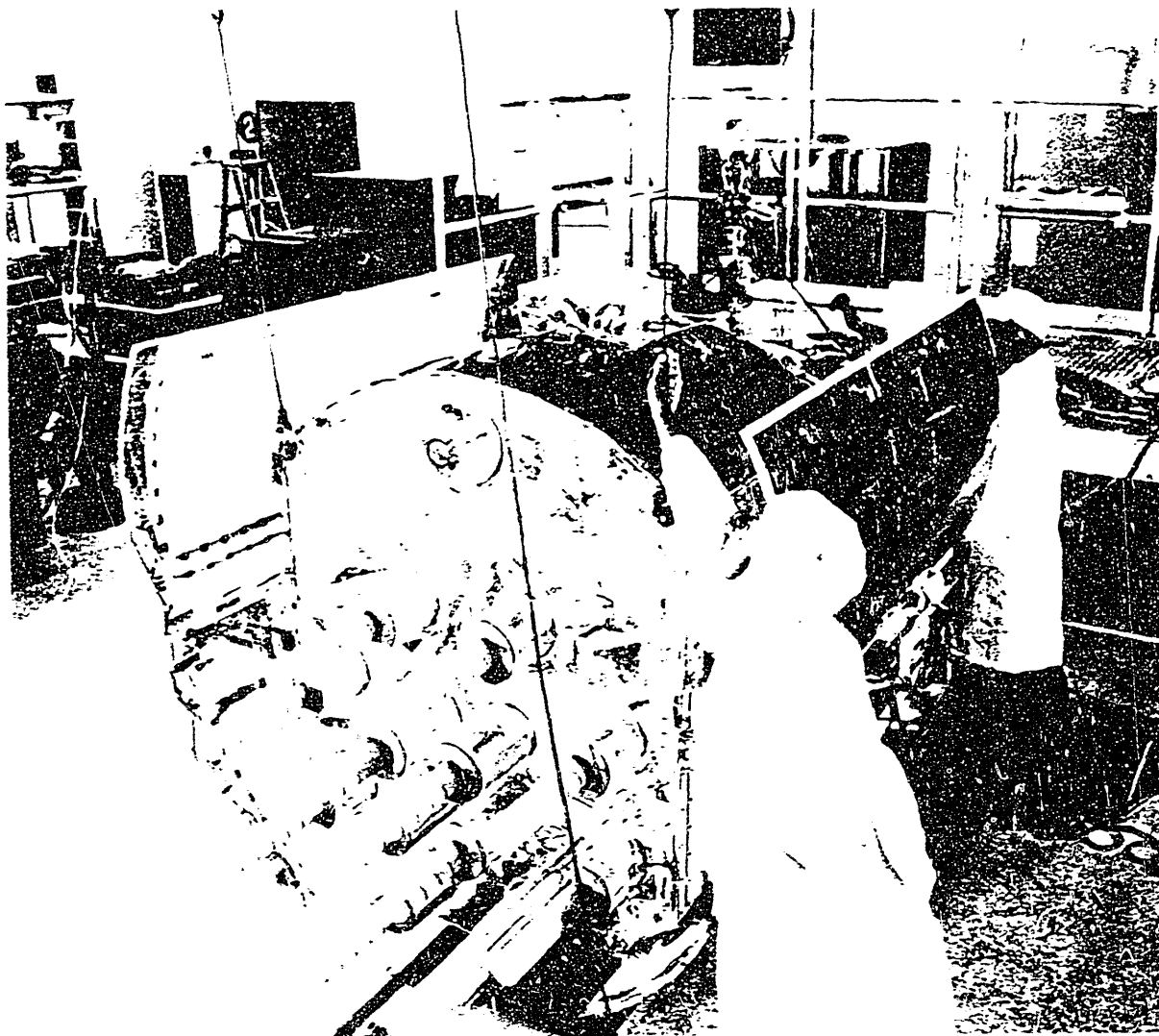
Feb 1980 - Navstar 5 launch.

Apr 1980 - Second Minuteman III with GPS receiver launched.

Apr 1980 - Navstar 6 launch.

Sep 1980 - IBM awarded contract to design/develop Operational Control System (OCS) (Phase III).

Dec 1980 - Rockwell International awarded contract for development and qualification of Block II operational satellite.



(USAF Photo 114843)

ENGINEERS WEIGH AND BALANCE A NAVSTAR GPS SATELLITE prior to packaging it for shipment to the Air Force's west coast launch site at Vandenberg AFB, CA.

For additional information, contact:

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